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STATUS OF POPLAR TENTMAKER IN THE
LOWER MISSISSIPPI RIVER DELTA

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STATUS OF POPLAR TENTMAKER
IN THE
LOWER MISSISSIPPI RIVER DELTA

By

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INTRODUCTION

This report is a summary of the poplar tentmaker (Ichthyura inclusa Hubner, Lepidoptera:Notodontidae) problem affecting cottonwood plantations and natural stands in the Lower Mississippi River Delta. It gives a history of the insect's occurrence in the Delta and includes a discussion of factors which make the insect a possible threat to cottonwood plantations. The efforts made to deal with the problem are briefly discussed. Until recently, the work has been primarily a Research effort. However, present efforts and planning for future endeavors have been a cooperative effort among the Research and State and Private Forestry branches of the U.S. Forest Service, the Forestry Commissions of the States of Arkansas and Mississippi, and the Louisiana Department of Natural Resources, Office of Forestry.

HISTORY OF OCCURRENCE

In the last 2 years (1977-78), thousands of acres of hardwood trees in the South, particularly in the Lower Mississippi River Delta, have been defoliated by several insect species, including sycamore tussock moth, hackberry and snout butterflies, oakleaf miner, pinkstriped and orangestriped oakworms, and poplar tentmaker. Generally, these species are not major problems and their impact has been considered minor or insignificant. However, the last 2 years have been unusual in that lepidopterous defoliators have been abundant. The unusually cold winters and dry springs of the past few years may have contributed to the unusual amount of defoliator activity. The cold winters (Jan. '77, 13° below normal; Jan. '78, 10° below normal) may have

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had more impact on the natural enemies than on the defoliators because defoliators often overwinter in less exposed locations than do their parasites and predators (Solomon and Cook 1978; J. D. Solomon, personal communication). The dry springs probably provided the insects with a more nutritious diet. It is generally agreed that water deficits increase the conversion of starch to sugar in the plant kingdom (Kramer and Koslowski 1960).

The poplar tentmaker, *Ichthyura inclusa*, which feeds on poplars and willows, has gained more attention than the other species and has become a major concern in cottonwood plantations in the Lower Mississippi River Delta. The tentmaker gets its name from the silken "tent" which the larvae construct and reside in when not feeding (fig. 1). Researchers at the Southern Hardwoods Laboratory at Stoneville, Mississippi, began studying this insect in the fall of 1977 when large populations first appeared.



Figure 1. "Tent" pulled back to reveal poplar tentmaker larvae on cottonwood leaf.

Prior to 1977, the tentmaker had been an endemic species in natural stands of cottonwood. Occasionally, enough damage was done on individual trees that defoliation could be seen from the ground. However, there was no record of complete defoliation of even a single cottonwood tree in the Lower Mississippi River Delta by poplar

tentmaker (PTM). Yet, in September and October of 1977, this insect defoliated approximately 20,000 acres of cottonwood plantations (primarily at Hookers Ridge and Fidler, MS). Then during 1978, PTM completely or partially defoliated 10,000 acres of plantations and thousands of acres of natural stands of cottonwood and willow in the Lower Mississippi River Delta. Some plantations were defoliated as early as July 21, and others were not defoliated until September 20. Generally, plantations that were defoliated early in the growing season were defoliated at least once more that year. The time in which a stand can be defoliated is amazing! In July 1978, second-generation larvae completely defoliated 2,000 acres of 6-yr-old cottonwood plantations in just 3 days!

SIGNIFICANCE OF PROBLEM

PTM may be part of a problem which has recently appeared in Delta plantations. Crown thinning, dieback, and some tree mortality have occurred at several plantations. In some cases, mortality occurred in stands which had been defoliated by insect and/or disease agents the previous year. For example, a 1,400-acre plantation in Arkansas suffered fungal defoliation in 1977. In spring 1978, many of the trees had thin crowns, with leaf clumps at the branch ends. By late June, many of these branches had died. However, the trees started growing and additional healthy leaves appeared. Then in July, the trees were defoliated by PTM. The 2 years of defoliation may cause tree mortality by the spring of 1979.

Generally, defoliation of hardwoods is important only when it happens early in the growing season or when it occurs for several years in succession. But defoliation late in autumn, prior to leaf fall, may have greater impact on cottonwood. Fast-growing species, such as cottonwood, have only small reserves of carbohydrates and sugars. However, in autumn, prior to leaf fall, 61 percent of the nitrogen and 53 percent of the phosphorous produced in cottonwood leaves is translocated into the bark to provide for the spring flush of growth (Baker and Blackmon 1977). Premature defoliation prevents this translocation. After defoliation, new leaves must grow to approximately 3 inches in length before they become an asset to the tree (Dickman 1971). It takes approximately 2 weeks for leaves to reach 3 inches in length. If leaf fall occurs before this growth is obtained and the trees have not had time to replenish the nutrients thus used, then they lack the necessary reserves for next year's flush of growth. Thus, cottonwood trees defoliated late in the year may have very thin crowns and little growth the following year.

Another effect of defoliation on cottonwood trees is reduced growth. Several canker-causing disease organisms are commonly present in cottonwood plantations, but cottonwood's fast growth keeps their impact to a minimum. However, when tree growth is reduced, spring growth of the canker organisms can outgrow the trees and cause branch or tree

mortality. In late September of 1977, a 1,000-acre, 3-yr-old cottonwood plantation in Mississippi was defoliated by PTM. The plantation was located on a poor, heavy clay site. Before leaf fall occurred, the trees were seriously weakened from the combined stress of poor site, PTM defoliation, and frost kill of new growth. By April 1978, many of the trees had become infected with Cytospora, Fomopsis, and Fusarium cankers, which resulted in approximately 20 percent tree mortality. One 40-acre field suffered more than 80 percent mortality (F. L. Oliveria, unpublished data).

WHAT HAS BEEN DONE

The sudden appearance of poplar tentmaker as a new pest of cottonwood plantations in September 1977 caused concern both to cottonwood growers and the Southern Hardwoods Laboratory. The scientists at Stoneville had been working with insect problems of intensively-cultured cottonwoods for several years and this was the first time that an insect problem of this magnitude had appeared.

The first step was to begin intensive observation of the biology of the insect and the extent of damage that it caused. However, even though little was known about the biology and importance of PTM, the main concern of the growers was control. Therefore, during October 1977, researchers conducted tests using Sevin® and Dursban® for control of tentmaker larvae. The results were submitted to EPA to secure 24C category (special local needs) registration of Sevin Sprayable® (80 percent wettable powder) in Mississippi and of Dursban 4E® in the States of Louisiana, Arkansas, Missouri, Tennessee, and Kentucky. All applications were granted by the spring of 1978.

During the summer of 1978, the Southern Hardwoods Laboratory established 5-year impact plots in three cottonwood plantations near Greenville, Mississippi. First year field measurements were collected in December 1978.

Also, during the summer and fall, biology data were collected from field and laboratory observations. It was learned that PTM has four, and a partial fifth, generations in the Lower Mississippi River Delta. They overwinter as fourth or fifth generation pupae. The length of the generations varies from 56 days in April and May to as short as 32 days during July and August. There appear to be five distinct larval instars and most of the defoliation is caused by the late fourth instar and fifth instar larvae. The larvae stay in the tents during the day and leave them at night to feed. The adults will mate within three hours after emergence. Each female will lay about 400 eggs in two or three egg masses.

Nine egg and larval parasites of PTM were collected and sent to the Insect Identification Laboratory at Beltsville, Maryland, for identification. The possibility of using one or more of these parasites in

an integrated pest management program looks promising, especially the use of an egg parasite. The larval parasites are less promising for PTM control because they did not cause mortality before substantial defoliation had occurred.

For plantation managers to apply effective control measures, there must be a sampling method available that is simple, accurate, and easy to use. Control strategies for PTM must be planned while the larvae are small and little damage is noticeable. Once extensive defoliation is noticeable from the ground, the larvae have matured enough that there is not sufficient time to plan and implement control measures before undesirable damage occurs. The density of PTM populations can build up to such high levels that an entire plantation can be 100 percent defoliated in 2 to 3 days (figs. 2 and 3).



Figure 2. Part of a 2,000-acre, 6-yr-old cottonwood plantation near Catfish Point, Miss. on July 19, 1978. Samples on that date averaged 800 fourth and fifth instar larvae/limb.



Figure 3. The same plantation 3 days later on July 22, 1978.

In the lower Mississippi River Delta during 1978, several methods were tested to sample PTM populations and to correlate sample size with subsequent defoliation. Egg mass sampling showed some promise, but more research is necessary before accurate predictions can be made using only egg mass counts. So far the best method found to predict population density is larvae per tent. However, this method has some serious shortcomings. Probably the most serious problem is the amount of work and time required to do adequate sampling.

An informal meeting on PTM was held in August 1978 at the Southern Hardwoods Laboratory in Stoneville, Mississippi. Those involved included researchers with the Hardwood I&D Project, entomologists with FI&DM's Aerial Survey Team and Alexandria Field Office, and forest pest specialists with the Arkansas and Mississippi Forestry Commissions and the Louisiana Office of Forestry. Several activities were planned:

- 1) Research would make inquiries and find out if PTM was a problem in cottonwood plantations north of Arkansas and Mississippi.
- 2) The Aerial Survey Team, in cooperation with the States, would make an aerial survey of cottonwood plantations.

- 3) The States and FI&DM would explore the possibility of State projects.
- 4) The States of Arkansas and Louisiana would investigate the need for State registration of Sevin for PTM control.

The group met again a few weeks later with personnel from the Southeastern Area Office of FI&DM. Discussion centered on the pros and cons of cooperative suppression projects for the PTM. Whether or not large populations of PTM would be present for a third year (1979) was not known. However, it was decided that the best course of action was to gather information and develop procedures necessary for putting together a suppression project.

The tasks agreed on at the first meeting were discussed and defined in more detail as follows:

- 1) Conduct an aerial survey of cottonwood plantations about the second week in September (Aerial Survey Team in cooperation with the States).
- 2) Determine need for 24C registration of Sevin Sprayable (80 percent wettable powder) for PTM control in States outside of Mississippi. If they are needed, work to obtain State labels in Arkansas and Louisiana (States with assistance of Southeastern Area Office and Research).
- 3) Work out procedures for biological evaluation of PTM (Alexandria Field Office and Research).
- 4) Continue loss assessments for use in biological, environmental, and benefit-cost evaluations (Research).
- 5) Develop benefit-cost evaluation procedures (Southeastern Area Office and Alexandria Field Office).
- 6) Identify items needed for Environmental Assessment (Alexandria Field Office and Southeastern Area Office).

An aerial detection survey (100 percent) was conducted during the week of September 10, 1978, to look at third generation PTM defoliation. Twenty-one cottonwood plantations were surveyed (34,500 acres) in the Lower Mississippi River Delta in the States of Arkansas, Louisiana, and Mississippi. Another detection survey, conducted the last week in October, was flown to determine fourth generation defoliation. The location of additional cottonwood plantations was determined after the September survey so that 36 plantations (42,700 acres) were examined in October. The amount of defoliation varied from

0 percent to 95 percent between and within plantations. Reports of the two surveys are in Appendix I. All plantations were not ground checked, but PTM was confirmed in 12 of the plantations ranging from the extreme southern to the extreme northern plantation. Figure 4 is an aerial view of PTM defoliation present in a plantation during the October survey.



Figure 4. Cottonwood plantation defoliated by poplar tentmaker, October 1978.

The cottonwood plantations in the lower Mississippi River Delta are on a flood plain and most are privately owned. Six companies own most of the plantations surveyed in September and October. Interest in a cooperative suppression project was expressed by five of the companies. Investigations of Environmental Assessment requirements showed that extensive public review of Environmental Statements and Environmental Assessment Reports is required for proposed actions on a flood plain. After discussions between company officials and State pest specialists, the result was that cost-sharing control projects would not be requested by the States, either now or in the foreseeable future. Therefore, work on developing a benefit/cost evaluation procedure has been deferred. Individual companies will probably continue to conduct control efforts as they deem necessary.necessary.

Due to the Federal Pesticide Act of 1978, which amended FIFRA, a question arose concerning the need for 24C registration of Sevin Sprayable for PTM. EPA was contacted and stated that, according to the amendment, Sevin Sprayable can be applied to cottonwood trees in plantations and natural stands. This is because Sevin Sprayable:

- is registered for control of pests on forest trees,
- is applied at the same dosage rate, and
- is not prohibited for use on cottonwood trees for PTM.

Therefore, a 24C registration is not necessary (Appendix II).

PRESENT AND FUTURE ACTIVITIES

Even though cost-sharing control projects are not expected in the near future, PTM will continue to be of concern to cottonwood managers and growers. Continued defoliation and possible growth loss and mortality in high value cottonwood plantations cannot be tolerated by industry or private land owners. Coordination of efforts and cooperation among the States, Research, and FI&DM will continue to be an important aspect of dealing with the PTM problem.

There are still questions concerning the biology, sampling, impact, control, and evaluation of PTM that need to be answered. In addition, training should be provided for State pest specialists, foresters, and plantation managers so they can effectively monitor and control tentmaker infestations. The following activities have been initiated or planned:

- 1) Sampling: Refinement of egg and larval sampling methods will continue. Accurate sampling will simplify control strategies and improve precision of population prediction.
- 2) Impact Plots: The impact plots established near Greenville, Mississippi in 1978 will be continued for 5 years. The data from these plots will be used in assessing the damage caused by poplar tentmaker in cottonwood plantations. Preliminary indications are that heavy defoliation is very harmful to cottonwood, especially when it occurs during late summer or early fall. Repeated defoliations will probably cause severe growth reduction and mortality.
- 3) Bud Survey: A bud survey is being conducted by Research at the present time to determine the effect of late season defoliation on the formation and survival of overwintering buds. If bud formation is seriously affected, this may account for much of the crown thinning and dieback that has been appearing the following spring in cottonwood plantations that had been 80 to 100 percent defoliated September and October the previous year.

- 4) PTM Workshop: A PTM Workshop for company personnel and service foresters will be held in late May or early July. The date will depend on the PTM populations available. FI&DM, Research, and State pest specialists will have active parts in the workshop. Classroom and field sections will cover identification, sampling methods, and control techniques and safety.
- 5) Biological Evaluation: Based on available research, FI&DM will begin developing a biological evaluation procedure.

Before reliable management strategies can be developed, additional work is needed on the biology and sampling of the pest. Some of the key technology gaps that have been identified are:

- 1) Adult emergence: One of the key pieces of information needing attention is adult emergence schedules. Once this is determined, the timing of the rest of the generation can be correctly predicted. Light traps could be used to collect adult moths at the beginning of each generation, or at least in the spring, to trap the emerging overwintering adults.
- 2) Pupal sampling: Sampling overwintering pupae may be the best way to predict the following season's population; however, an acceptable method for locating overwintering pupae has yet to be developed. Some methods of trapping the pupae in the fall are being tested by Research.
- 3) Biological Control: Accurate prediction of the generation timing of the poplar tentmaker will allow more precise work on the biology of the parasites of the tentmaker. Collection of the parasites depends on precise coordination with the life stages of the poplar tentmaker. Egg parasites have been collected that may be used as biological control agents in cottonwood plantations or as valued parts of an integrated pest management system. The possibility of using an egg parasite in a biological control field test or pilot study has been suggested and research data indicate a reasonable chance of success.

LITERATURE CITED

- Baker, J. B. and B. G. Blackmon.
1977. Biomass & nutrient accumulation in a cottonwood plantation -
The first growing season. Soil Science Society of Am. Jour.
Vol. 41. pp 632- 636.
- Dickman, D. I.
1971. Photosynthesis and respiration by developing leaves of
cottonwood. Botanical Gazette. Vol. 132. pp 253 - 259.
- Kramer, P. J. and T. T. Kozłowski.
1960. Physiology of trees. McGraw-Hill Book Company, Inc.
N. Y. 642 pp.
- Solomon, J. D. and J. R. Cook.
1978. Epidemic 1977 - year of the hardwood lepidopterous
defoliators. J. Miss. Acad. Sci. (Suppl.) 23:1

APPENDIX I

APPENDIX I

See Reports
79-3-005
79-3-006